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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re U.S. Patent No. 6,792,439	)	Serial No. 09/833,962
	)	
Inventor(s): Douglas Charles SCHMIDT	)	Filed: April 13, 2001
	)	
Issue Date: September 14, 2004	)	Attorney Docket No. 000479.00024

For: METHOD AND APPARATUS FOR GENERATING RANDOM NUMBERS WITH IMPROVED STATISTICAL PROPERTIES

REQUEST FOR CERTIFICATE OF CORRECTION

U.S. Patent and Trademark Office
Customer Service Window
Randolph Building, Mail Stop: Certificate of Correction Branch
401 Dulany Street
Alexandria, VA 22314

Certificate
MAY 1 8 2005
of Correction

Sir:

Pursuant to 35 U.S.C. § 254 and 37 C.F.R. § 1.322, this is a request for the issuance of a Certificate of Correction in the above-identified patent. Two (2) copies of PTO Form 1050 are appended. The complete Certificate of Correction involves one page.

The mistakes identified in the appended Form occurred through no fault of the Applicant, as clearly disclosed by the records of the application, which matured into this patent. Enclosed for your convenience are the relevant portions of the Amendment filed April 13, 2004, and the Specification as filed April 13, 2001.

Issuance of the Certificate of Correction containing the corrections is respectfully requested. Since these changes are necessitated through no fault of the Applicant, no fee is believed to be associated with this request. Nonetheless, should the Patent and Trademark Office determine that a fee is required, please charge our Deposit Account No. 19-0733.

Respectfully submitted,

BANNER & WITCOFF, LTD.

Dated: May 13, 2005

By: [signature]
Ross A. Dannenberg
Registration No. 49,024

1001 G Street, N.W. (11th Fl.)
Washington, D.C. 20001
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UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO.: 6,792,439

DATED: September 14, 2004

INVENTOR(S): Douglas Charles SCHMIDT *et al*

It is certified that errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In Column 7, Claim 4, Line 23:
Please replace "oft" with --of t--

In Column 7, Claim 6, Lines 36 and 38:
Please replace "Δt^i," with --Δt^i_j--

In Column 9, Claim 20, Line 14:
Please replace "i_{th}" with --i^{th}--

In Column 9, Claim 24, Line 58:
Please replace "oft" with --of t--

In Column 11, Claim 33, Line 6:
Please replace "c," with --c_i--

In Column 12, Claim 34, Line 1:
Please replace "μ_i" with --λ_i--

In Column 12, Claim 35, Line 14:
Please replace "c," with --c_i--

In Column 12, Claim 35, Line 49:
Please replace "time" with --time t--

In Column 13, Claim 35, Lines 6 and 7, 8 and 9:
Please replace "for the respective random number generator" with --for the one of the random number generators--

In Column 14, Claim 47, Line 42:
Please replace "i^{th}-1)" with --(i^{th}-1)--

In Column 16, Claim 54, Line 7:
Please replace "where is" with --where P^i_j is--

Mailing Address of Sender:

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1001 G Street, N.W.
Washington, DC 20001-4597

U.S. PAT. NO 6,792,439

No. of add'l copies
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FORM PTO 1050 (Rev.2-93)

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■ PATENT ☐ DESIGN B&W Ref. 000479.00024 Date 4/13/04
☐ HAND CARRY Group/Section ______ Bldg ______ Rm ______
Serial/Patent No. 09/833,962 Atty/Sec JMP/BCW/RAD
Inventor Douglas Charles Schmidt Client SAIC
Title Method And Apparatus For Generating Random Numbers With Improved Statistical Properties

The following has been received in the U.S. Patent and Trademark Office on the date stamped hereon:

☐ ______ total pp Spec., including: # of Claims ______ (# of independent claims ______); ☐ Abstract
☐ Drawings: ☐ Formal ☐ Informal
# of distinct sheets ______ Figs. ______
☐ Declaration/Power of Attorney: ☐ Executed ☐ Unexecuted
☐ Assignment w/PTO Cover Sheet
☐ IDS w/PTO 1449 ☐ References ☐ w/Fee
☐ Preliminary Amendment
☐ Priority Claim (Foreign or U.S. Provisional B&W # ______)
Country ______ Appl. # ______ Date ______
☐ w/Foreign Priority Document(s)
☐ Application: ☐ CIP ☐ Continuation ☐ Divisional
Parent Ser. No. ______ B&W# ______
☐ U.S. Provisional ______ pp Spec/Claims; Cover Sheet
☐ Response to Missing Parts/Requirements dtd ______
☐ Response to Notice to File Corrected Appln. Papers dtd ______
☐ Request for Expedited Foreign Filing License
☐ Request for Corrected: ☐ Filing Receipt ☐ Assignment
☐ Response to Restriction/Election Requirement

☐ Sequence Listing: ☐ Diskette ☐ Paper
■ Amendment ☐ Response: OA dtd 1/21/04
☐ Petition for Extension of Time until ______
☐ CPA ☐ RCE ☐ w/Ext of Time: OA dtd ______
☐ Request for Approval of Drawing Changes
☐ Notice of Appeal & Fee
☐ Brief: ☐ Appeal & Fee ☐ Reply
☐ Request for Oral Hearing
☐ Issue Fee ☐ Advance Patent Copies (# ordered ______)
Notice of Allowance dtd ______
☐ Amendment under 37 CFR 1.312
☐ Request for Certificate of Correction
■ Transmittal ■ Fee Transmittal w/Auth. to Charge Deposit Acct.
☐ Certificate of Mailing
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:		Atty. Docket No.:	000479.00024
Douglas Charles SCHMIDT			
Serial No.:	09/833,962	Group Art Unit:	2124
Filed:	April 13, 2001	Examiner:	Malzahn, David H
For:	Method And Apparatus For Generating Random Numbers With Improved Statistical Properties	Confirmation No.:	3828

AMENDMENT

Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Office Action mailed January 21, 2004, please amend the instant application as follows:

Amendments to the Claims are reflected in the Listing of Claims, which begins on page 2 of this paper.

Remarks/Arguments begin on page 18 of this paper.

If any fees are required or if an overpayment is made, the Commissioner is authorized to debit or credit our Deposit Account No. 19-0733, accordingly.

(5) calculating a new value using a random number generator corresponding to the lowest time value;

(6) mapping the new value to a corresponding time value; and

(7) repeating steps 3 through 4 to generate another random number.

45. (New) The computer-implemented method of claim 43, wherein step (2) comprises:

(a) converting each calculated value to a probability number;

(b) for each probability number, determining a corresponding time increment based on the probability number; and

(c) determining each corresponding time value based on the time increment and a previous arrival time.

46. (New) The computer-implemented method of claim 43, wherein act (4) comprises: determining P_i as the random number, wherein:

$P_i = e^{-n(t_i - t_{i-1})}$, where P_i is the i^{th} random number generated, n is a number of random number generators and $t_i - t_{i-1}$ is a difference between a value of the time t at an i^{th} arrival time and a value of the time t at an (i^{th}-1) arrival time.

47. (New) The computer-implemented method of claim 43, wherein act (4) comprises: determining P_i as the random number, wherein:

$P_i = e^{-\left(\sum_{j=1}^{n} \lambda_j\right)(t_i - t_{i-1})}$, where P_i is the i^{th} random number generated, λ_j is an average arrival rate for the j^{th} random number generator, where j will vary from 1 to n, n is a number of random number generators, and $t_i - t_{i-1}$ is a difference between a value of the time t at an i^{th} arrival time and a value of the time t at an (i^{th}-1) arrival time.

48. (New) An apparatus for generating random numbers comprising:

52. (New) The machine-readable medium of claim 51, wherein act (a) comprises:

(a1) adding 1 to each calculated value to produce a corresponding sum value; and

(a2) dividing each sum value by 1 plus a maximum value which is generated by a corresponding one of the random number generators to produce the probability number.

53. (New) The machine-readable medium of claim 51, wherein act (b) further comprises:

(b1) determining the time increment Δt_j^i based on:

$\Delta t_j^i = \frac{-\ln(P_j^i)}{\lambda_i}$, where P_j^i is the probability number and λ_i is the average arrival rate for a corresponding one of the random number generators.

54. (New) The machine-readable medium of claim 51, wherein act (b) further comprises:

(b1) determining the time increment Δt_j^i based on:

$\Delta t_j^i = -\ln(P_j^i)$, where P_j^i is the probability number.

55. (New) The machine-readable medium of claim 49, wherein step (4) comprises:

determining P_i as the output random number, wherein:

$P_i = e^{-n(t_i - t_{i-1})}$, where P_i is the ith random number generated, n is a number of random number generators and $t_i - t_{i-1}$ is a difference between a time value at an ith arrival time and a time value at an (ith-1) arrival time.

56. (New) The machine-readable medium of claim 49, wherein step (4) comprises:

determining P_i as the output random number, wherein:

$P_i = e^{-\left(\sum_{j=1}^{n}\lambda_j\right)(t_i - t_{i-1})}$, where P_i is the ith random number generated, λ_j is an average arrival rate for the jth random number generator, where j will vary from 1 to n, n is a number of

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☐ HAND CARRY Group/Section ______ Bldg ______ Rm ______

Serial/Patent No. ______ Atty/Sec RI/ww
Inventor Douglas Charles SCHMIDT Client ______
Title Method + Apparatus For Generating Random Numbers with improved Statistical Properties

The following has been received in the U.S. Patent and Trademark Office on the date stamped hereon:

- ☒ 31 total pp.Spec. including: # of Claims 36 (# of independent claims 7); ☒ Abstract
- ☒ Drawings : ☐ Formal ☐ Informal — # of distinct sheets 7 : Figs. 1-6
- ☒ Declaration/PoA : ☒ Executed ☐ Unexecuted
- ☒ Assignment w/PTO Cover Sheet
- ☐ Small Entity Declaration
- ☐ IDS w/PTO 1449 ☐ References ☐ w/Fee
- ☐ Preliminary Amendment
- ☐ Priority Claim (Foreign or U.S.Prov. B&W# ______) Country / Appl. # / Date
  - ☐ w/Foreign Priority Document(s)
- ☐ Application : ☐ CIP ☐ Continuation ☐ Divisional — Parent Ser. No. ______ B&W# ______
- ☐ U.S. Provisional ______ pp Spec/Clms; Cover Sht.
- ☐ Response to Missing Parts/Rqmts. dtd ______
- ☐ Request for Expedited Foreign Filing License
- ☐ Request for Corrected : ☐ Filing Rec ☐ Assignment
- ☐ Response to Restriction/Election Requirement
- ☐ Sequence Listing : ☐ Diskette ☐ Paper
- ☐ Amendment ☐ Response : OA dtd ______
- ☐ CPA ☐ RCE ☐ w/Ext of Time : OA dtd ______
- ☐ Petition for Extension of Time until ______
- ☐ Request for Approval of Drawing Changes
- ☐ Notice of Appeal & Fee
- ☐ Brief : ☐ Appeal & Fee ☐ Reply
- ☐ Request for Oral Hearing
- ☐ Issue Fee ☐ Adv. Patent Copies (#ordered ____) Notice of Allowance dtd ______
- ☐ Amendment under 37 CFR 1.312
- ☐ Request for Certificate of Correction
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RETURN WHEN SERIAL NUMBER IS ASSIGNED TO APPLICATION

USPTO: Please return this card, indicating receipt date and Application Serial No. of the following patent application:

Applicant(s): Douglas Charles SCHMIDT

Title: Method and Apparatus For Generating Random Numbers with Improved Statistical Properties

Filing Date: 4/13/01

Client: ______ Client Ref.: ______

Attorney/Secretary: RI/ww

J1046 U.S. PTO
09/833962
04/13/01

B&W Rev. 10/00

4. A computer-implemented method of generating random numbers using a plurality of random number generators, the method comprising:

(1) using each of the random number generators to calculate a value of x for each of the random number generators;

(2) mapping each of the values of x to a respective time t for each of the random number generators;

(3) determining which one of the random number generators has the time t with a value being less than or equal to the respective time t of each of other ones of the random number generators; and

(4) generating, as output, a random number based on the lowest value of t determined in act (3).

5. The computer-implemented method of claim 4, further comprising:

(5) using the one random number generator determined in act (3) to calculate a new value of x;

(6) mapping the new value of x to a new value of t; and

(7) repeating acts 3 through 4 to generate another random number.

6. The computer-implemented method of claim 4, wherein act (2) comprises:

(a) converting the value of x to a probability number having a value between 0 and 1;

(b) determining a time increment Δt_j^i based on the probability number; and

(c) determining the time t based on the time increment Δt_j^i and a previous arrival time.

7. The computer-implemented method of claim 6, wherein act (a) comprises:

(a1) adding 1 to the value of x to produce a sum; and

(a2) dividing the sum by 1 plus a maximum value c which is generated by a corresponding one of the random number generators to produce the probability number.

8. The computer-implemented method of claim 6, wherein act (b) further comprises:

(b1) determining the time increment Δt_j^i based on:

17. The apparatus of claim 14, wherein each of the converters further comprises an inter-arrival time calculator configured to receive the probability number from the Xconverter and determine a time increment Δt_j^i based on:

$\Delta t_j^i = -\ln\left(P_j^i\right)$, where P_j^i is the probability number.

18. The apparatus of claim 16, wherein each of the converters further comprises an arrival time calculator that is configured to receive the time increment from the inter-arrival time calculator and determine a next arrival time based on the time increment.

19. The apparatus of claim 13, wherein the selector comprises a comparator to compare the arrival times associated with each of the random number generators and to select the arrival time having the lowest value.

20. The apparatus of claim 19, wherein the selector further comprises a producer to receive the arrival time having the lowest value and to generate a random number P_i, wherein:

$P_i = e^{-\left(\sum_{j=1}^{n}\lambda_j\right)(t_i - t_{i-1})}$, where P_i is the i^{th} random number generated, λ_j is an average arrival rate for the j^{th} random number generator, where j will vary from

(4) generating another event on one of the independent streams having the selected event;

(5) repeating acts 2 through 4 until a desired quantity of random numbers are produced.

24. A machine-readable medium having instructions recorded thereon, the instructions comprising:

(1) using each of a plurality of random number generators to calculate respective random number values of x;

(2) mapping each of the respective values of x to a respective time t for each of the random number generators;

(3) determining which one of the random number generators has the time t with a value being less than or equal to the respective time t of each of other ones of the random number generators; and

(4) generating, as output, a random number based on the lowest value of t determined in act (3).

25. The machine-readable medium of claim 24, further comprising:

(5) using the one random number generator determined in act (3) to calculate a new value of x;

determining P_i as the random number, wheren:

$P_i = e^{-n(t_i - t_{i-1})}$, where P_i is the ith random number generated, n is a number of random number generators and $t_i - t_{i-1}$ is a difference between a value of the time t at an ith arrival time and a value of the time t at an (ith-1) arrival time.

32. The machine-readable medium of claim 24, wherein act (4) comprises:

determining P_i as the random number, wherein:

$P_i = e^{-\left(\sum_{j=1}^{n} \lambda_j\right)(t_i - t_{i-1})}$, where P_i is the ith random number generated, λ_j is an average arrival rate for the jth random number generator, where j will vary from 1 to n, n is a number of random number generators, and $t_i - t_{i-1}$ is a difference between a value of the time t at an ith arrival time and a value of the time t at an (ith-1) arrival time.

33. A computer-implemented method of generating random numbers using a plurality of random number generators, the method comprising:

(1) calculating a random number value of x from each of a plurality of random number generators;

(2) converting each of the values of x to a respective probability number according to a formula: $P_j^i = \frac{x+1}{c_i+1}$, where P_j^i is the respective probability number and c_i is a maximum number which can be generated by a respective one of the random number generators;

(3) determining a respective time increment Δt_j^i for each of the respective random number generators based on the respective probability number P_j^i for each of the random number generators according to a formula:

$\Delta t_j^i = \frac{-\ln(P_j^i)}{\lambda_i}$, where λ_i is the average arrival rate for an i^{th} one of the random number generators;

(4) determining a respective arrival time t for each of the random number generators by adding a current time to the respective time increment Δt_j^i to produce the respective arrival time t;

(5) determining which one of the random number generators has a smallest value of the arrival time t;

(6) generating a random number P_i according to a formula:

$P_i = e^{-\left(\sum_{j=1}^{n}\lambda_j\right)(t_i - t_{i-1})}$, where λ_j is an average arrival rate for the j^{th} random number generator, where j will vary from 1 to n, n is a number of random number generators, and $t_i - t_{i-1}$ is a difference between a value of the time t at an

34. The method of claim 33, wherein λ_i = 1.

35. A machine-readable medium having instructions recorded thereon, the instructions comprising:

(1) calculating a random number value of x from each of a plurality of random number generators;

(2) converting each of the values of x to a respective probability number according to a formula: $P_j^i = \frac{x+1}{c_i+1}$, where P_j^i is the respective probability number and c_i is a maximum number which can be generated by a respective one of the random number generators;

(3) determining a respective time increment Δt_j^i for each of the respective random number generators based on the respective probability number P_j^i for each of the random number generators according to a formula:

$\Delta t_j^i = \frac{-\ln(P_j^i)}{\lambda_i}$, where λ_i is the average arrival rate for an i^{th} one of the random number generators;

(4) determining a respective arrival time t for each of the random number generators by adding a current time to the respective time increment Δt_j^i to produce the respective arrival time t;

(5) determining which one of the random number generators has a smallest value of the arrival time t;

(6) generating a random number P_i according to a formula:

$P_i = e^{-\left(\sum_{j=1}^{n}\lambda_j\right)(t_i - t_{i-1})}$, where λ_j is an average arrival rate for the j^{th} random number generator, where j will vary from 1 to n, n is a number of random number generators, and $t_i - t_{i-1}$ is a difference between a value of the time t at an i^{th} arrival time and a value of the time t at an (i^{th}-1) arrival time, where t_i has the smallest value of the arrival time t determined by act 5;

(7) determining a new value of x for the one of the random number generators;

(8) converting the new value of x to the respective probability number according to the formula: $P_j^i = \frac{x+1}{c_i+1}$, where P_j^i is the respective probability number and c_i is a maximum number which can be generated by the one of the random number generators;

(9) determining the respective time increment Δt_j^i for the respective random number generator based on the respective probability number Pn for the one of the random number generators according to the formula:

$\Delta t_j^i = \frac{-\ln(P_j^i)}{\lambda_i}$, where λ_i is the average arrival rate for the one of the random number generators;

(10) determining a respective arrival time t for the one of the random number generators by adding the current time to the respective time increment Δt_j^i to produce the respective arrival time t;

(11) repeating acts 5 through 10 to produce a next random number P_{i+1}.

36. The machine-readable medium of claim 35, wherein $\lambda_i = 1$.